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Letter

Scientific careers and gender differences. A qualitative study

Daniele Gouthier, Federica Manzoli, Donato Ramani

In Europe, much effort has been devoted to explore the causes of the decline in number of university matriculations of science students and to identify gender differences in career choice. Yet, the problem extends to the fulfillment of career plans: given their professional expectations and their attitudes when choosing a career, girls are much less likely to pursue scientific careers such as engineering or physics. Evidence of this is provided by the social research carried out within the framework of the GAPP project (Gender Awareness Participation Process). The Gapp project is intended to investigate differences between girls and boys in their perception of science careers and to propose a range of innovative and concrete participatory activities involving scientists, engineers and professionals from the public and private S&T sectors. In this letter, we report a synthesis of the results of the social research conducted as first step of the project: exploring how the perceptions of science professions affect interest, motivation and subject choice at school, at the university and consequently in their career.

In the context of the European project “Gapp”, a social research has been carried out on the perception of S&T carriers. Its aim has been to explore how the perception of science, technology and science professions affects interest, motivation and choice of subjects at school, at the university and consequently in young's career. The result of this study is expected to help implement an effective social dialogue and identify main issues and expectations from the research community, teachers, students, parents and opinion leaders in the field of S&T.

Gapp has used qualitative methods, among which focus groups and in-depth interviews. These methods have underlied practical activities aimed at overcoming gender differences.

In the six countries involved in this research -Italy, Poland, Belgium, Portugal, the Netherlands and Denmark- the starting point has been a perception of S&T which confirms the current stereotypes, as from other larger surveys as the Eurobarometer.

In general, sciences and technology have raised spontaneous positive feelings amongst participants.

Exact sciences are considered more difficult than humanities and imply a special talent. For students in particular, there is a significant gap between science itself and school science, which is mainly about education and learning process. In the students' opinion, the first one is good and has to do with *adventure, challenge, satisfaction and progress.* The second one is negative and has to do with *boredom, hard and unfruitful work, stress*.

On the other side, across the different targets involved, *technology* is firstly associated with new technological everyday-life products, that carry mainly positive effects on the society. The association with ICT products is absolutely evident. For almost everybody, technology is a synonym for information and communication technologies and is associated with the idea of a global society. Furthermore, the idea of technology goes well beyond reality. It being a hands-on activity, many students think that physical strength and the will to get dirty are needed and that it is therefore a better suited activity for boys than for girls.

Science as a matter of study is perceived as a very demanding activity mainly because it is associated with complexity, creativity, innovation, challenge, and non-routine performances. As a consequence, people working in S&T need to be intelligent, curious, inspired, and able to deal with new problems. At the same time, science is also associated with objectiveness and rigour. Therefore, creativity has to be coupled with a critical and rigorous attitude.

Science is also perceived as time consuming – important achievements can only be reached if people work for many years and social and economic recognition may not be achieved before long time. Therefore, people in science need to be persistent, patient, determined and intrinsically motivated. Students and parents in particular think that researchers should not be arrogant because they have to cope with their errors, as science implies a number of successive trials until a solution is found.

Common opinion is that, in principle, S&T carriers are not gender-oriented. As a general statement, people -especially females- want to make clear that gender discrimination, at school or in labour market, is not acceptable any more. Besides, people believe that in order to become a S&T professional a formal diploma and some characteristics such as intelligence, creativity and persistence are needed and they are thought as independent from the gender.

Confirming the results of the current studies on the gender issue in S&T, girls tend to emphasize a little more the social outcomes of S&T concerning health issues, whereas boys are slightly more attentive to the success that some well-known male scientists or technological entrepreneurs have achieved. Vice versa, gender differences in science and technology performance are recognized by all the targets. They are located in the sphere of social norms and believes or in the nature – apparent biological determination in a way of thinking. It is common thought that engineering and IT are predominantly male-oriented activities, due to the hands-on tasks connected with them. On the other hand, biology is felt as a more female-oriented subject, because it is connected with jobs that imply taking care of human beings' health or of animals. Other S&T professions do not have a precise gender characterization. Students and their parents remark that girls are more likely to think that the S&T profile is too difficult and choose a "safer" profile. Teachers claim that this choice is caused and confirmed by their social surroundings. Girls who do choose the S&T profile are often asked "Can you do that?", while it is considered a very sensible choice for boys.

As far as the influence in the choice of the career is concerned, a main role is played by personal interests and main actors are teachers and parents. In general, students think they choose, parents think teachers have the most important influence on their children and teachers believe it is parents who decide in higher social background and friends elsewhere.

Therefore, when it comes to encourage the youngsters to choose a S&T career, nobody thinks it is important to address special attention to girls.

Crossing the genders, it is relevant that students who choose a S&T profile, often do so in order to keep as many options as possible open. This is also what many parents explicitly advise them to do. On the other side, teachers claim that that is the reason why many students who had chosen a science profile do not go on to study exact sciences and technology in higher education.

These are the main results of the focus groups with students, parents and teachers.

What is the influence of gender in the career of people doing S&T as a profession?

Scientists at the top of their careers, directors of scientific and technological institutes, administrators, experts in gender issues stress the importance, for the emergence of a scientific vocation, of early contact with science and with practices that could raise the young's curiosity about the world. Some also stress the importance of having positive role models and to the critical role of family, mainly in creating the conditions for a free and safe career choice.

All of the interviewees, men and women alike, highlight some aspects in which their gender has always played an active role for their career. Although sometimes the gender role is described in negative terms, advantages are frequently mentioned.

On the top level, the deepest one as it involves the entire society: sexist prejudices emerge very soon and concern girls in particular. This is something that at the beginning keeps them away from a basic scientific education and later, at university or in the first stages of their academic career, it becomes a major obstacle. Men recognize that their gender has had an influence on their career. Sexist prejudices also interfere in ordinary social interaction.

Yet prejudices are even more evident when responsibilities must be shared and distribution of power is concerned, because historically men are in control. A female researcher is first seen as a woman and then as a researcher. According to the interviewees, given a substantial equality in the possibility to become a good researcher, there is a different social pressure on male and female workers, male and female scientists, wives and husbands, due to historical and cultural reasons. This also means that being a

woman can also be a further opportunity because it undoubtedly favours visibility. On the other side, today women are induced to search for an intellectual compensation.

The critical point seems to be society that, according to our witnesses, has barely evolved and is not at the height of the novelties that the new science will need.

The expectations for the change of women quantity and role are first of all connected with civilization changes. Much hope is connected with the growth of economic condition, population and more expenses for science. As for practical solutions, they depend on the reforms in the substance of educational systems, not in their structure. There has also been an agreement on policy based changes, which should target at equalisation of the proportion of genders in science. The idea of parity was especially criticised. In all the interviews there could be seen some consciousness of a cultural change with a double-fold effect. The positive side is the increase in the equality of women, differentiation and exchange of social roles. The negative side is the decrease of interest in difficult sciences by young people, not only girls.